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*The Reticulo-Endothelial System.

(By J. E. Bates, B.A., M.B.)

From the Department of Pathology, University of Toronto.

Although there had been glimmerings of a widely spread system of inter-related cells possessing phagocytic and other properties in common, it remained for Aschoff and Landau (1913) to gather up the threads spun by previous observers, to interweave with these the results of their own investigations and to crystalize to a great extent the present day conception of the "reticulo-endothelial metabolic apparatus" as they named it. Looking over the voluminous literature that has sprung up on this subject almost overnight, one finds that instead of simplifying the original conception, it has converted it into an intricate maze in which various investigators include different systems of cells, use variegated names to designate identical cells, and attribute all possible varieties of functions to the particular cells which they are pleased to include in this system.

In this paper an endeavor has been made to indicate which cells are generally accepted as comprising the reticulo-endothelial system, and the part played by these cells under certain experimental conditions, as well as in various conditions of health and disease.

The fact that certain cells of the body have the ability to ingest particulate matter, be it foreign particles, bacteria, or red blood cells, has long been known. Ranvier drew attention to the phagocytic properties of certain large branching cells found in loose connective tissues and called these cells "clasmatocytes." Metchnikoff, in 1883, was perhaps the first to have had some inkling of a widely distributed system of phagocytic cells throughout the organism. He differentiated clearly between the "microphages" or polymorphonuclear leucocytes and the more sessile "macrophages" which he found widely distributed. Among the macrophages he included the large cells of the splenic pulp and lymph nodes, certain endothelial cells (notably the Kupffer cells of the liver) and some of the connective tissue cells. In addition to the phagocytic properties of these cells he emphasized their importance in the formation of macrocytases, hemolysins, agglutinins and coagulins. Thus we see that Metchnikoff without the aid of vital staining methods had grasped the fundamentals of the reticulo-endothelial system as we understand it today.

In 1904 a new method of investigation, peculiarly adapted to the study of the anatomical distribution of the cells of the macrophage system, was introduced in the form of vital staining. In this year, Ribbert demonstrated these cells by means of lithium carmine injected intravenously. He re-

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ported the localization of the carmine in finely granular form in the endothelial and reticulum cells of the spleen, lymph nodes and bone marrow, the Kupffer cells of the liver, and certain cells of the connective tissues. It is worthy of note that the general vascular endothelium took the dye very feebly if at all. He subsequently demonstrated the specific capacity of these cells to absorb all sorts of substances introduced into the circulation. So far as the reticulo-endothelial system is concerned, the main results of Ribbert's work indicate that a certain number of cells throughout the organism manifest a strong power of attraction for dyestuffs in solution in addition to the phagocytosis of coarser particles of matter. In 1909 Goldmann was able to show that the cells which take up the vital stains are identical with the clasmatocytes of Ranvier and the macrophages of Metchnikoff. Thus, while vital staining afforded a better method of studying the macrophage system of Metchnikoff, it shed no new light on the histology, distrimution or function of these cells.

In 1913 Aschoff made a preliminary report on the results of vital staining as applied to normal and pathological tissues by his pupil Kiyono, who introduced the term "histiocyte" to designate the mononuclear phagocytes of the connective tissues. Comprehensive studies of vital staining were also reported by numerous other investigators about this time.

In summing up the results of these investigators, Aschoff states that intravitam staining with acid colloidal dyes results in the appearance of dye granules within certain of the mesenchymal cells. The granules vary in size and intensity in various cells and Aschoff has arranged these groups of cells in an ascending series according to the size of the granules and the degree of intensity with which they take up the dye:

1. The *endothelial cells* of the blood and lymph vessels, which take up the dye only after repeated injections, and then only in the form of minute granules.

2. The *fibrocytes,* or ordinary connective tissue cells. While these cells store the dye more readily than the endothelial cells, they do so only after prolonged staining, and also in the form of rather fine granules.

3. The *reticulum cells* of the splenic pulp, the cortical nodules and pulp cords of the lymph nodes, and ultimately the remainder of the lymphoid apparatus. These cells absorb the vital dye much more readily and more intensely than the fibrocytes, but in their staining reactions they fall behind the members of the following groups.

4. The so-called *reticulo-endothelial cells* of the sinuses of the lymph nodes, the blood sinuses of the spleen, the capillaries of the liver lobules (Kupffer stellate cells), the capillaries of the bone marrow, the adrenal cortex, and the hypophysis. These cells react to the vital dyes with greater rapidity and intensity than does any other group in the series.

5. The *histiocytes,* or wandering cells of the connective tissues. These stain almost as well as the specialized endothelial cells of the preceding group.

6. The *splenocytes* or pulp cells of the spleen and the vitally staining *monocytes* which originate from the tissue histiocytes and the reticulo-endothelial cells.

It is agreed that the cells of all these groups are closely related, but considerable difference of opinion prevails regarding which of these groups should be included in the reticulo-endothelial system. Aschoff would eliminate the common endothelial cells and the fibrocytes and he has behind him the general concensus of opinion, though Mallory and his followers would include all the endothelial cells and hold that free mononuclear phagocytes may develop from ordinary capillary endothelium.

Aschoff has combined the reticulum cells of spleen and lymph nodes toge-

ther with the specialized endothelium of the liver, spleen, bone marrow, lymph nodes, adrenal and hypophysis under the term reticulo-endothelial system because of a supposed common function in producing reticulum and of lining blood and lymph sinuses. Whether the reticular and endothelial cells of the spleen and lymph nodes are identical or not is a matter of controversy, but it is generally agreed that these cells exercise similar functions.

In addition to this somewhat sessile division of the reticulo-endothelial system, a more mobile branch must also be included. These cells were grouped by Kiyono under the term "histiocytic elements" and include the histiocytes of the connective tissue (clasmatocytes of Ranvier) and the splenocytes (pulp cells of the spleen) as well as the blood histiocytes.

At this point it is necessary to refer briefly to the work of Sabin, Cunningham and others who by means of supravital dyes were able to distinguish two types of histiocytes in the spleen, bone marrow, connective tissues and peritoneal exudates. These two types of cell, the monocyte and the clasmatocyte, not only react differently to supra vital dyes (neutral red and janus green), but also appear to arise from a different source. The monocytes when stained with neutral red, present a rosette of uniformly fine salmon-colored bodies, which are probably vacuoles, arranged about a clear centrosphere. While the monocytes phagocyte both small and large particles, they do so less readily than do the clasmatocytes and such particles tend to occur about the periphery of the cell because of the presence of the rosette. These cells appear to be derived from the primitive reticular cells. The clasmatocytes also exhibit bodies which stain with neutral red, but these vary considerably in size and color and form no pattern in the cytoplasm. These cells react vigorously to vital stains and engulf larger-sized particles than do the monocytes. The clasmatocytes are derived from the endothelium of the venous sinuses, particularly of the spleen. So that, according to these observers, there are two types of mononuclear phagocytes, the monocyte derived from reticular cells, and the clasmatocyte from specialized endothelium. Kiyono was the first to recognize "blood histiocytes" in the venous channels of the omentum, spleen, liver and bone marrow. These he demonstrated as vitally stained cells which, from their whole appearance, must have arisen from the specialized endothelial cells, splenocytes and tissue histiocytes and been shed or have migrated into the circulation. These cells he traced to the right side of the heart and to the lungs, where the majority are filtered out in the capillaries, a few of them pass through the filter of the lungs and enter the general circulation. Thus we see that the relatively fixed cells of this system may ultimately gain entrance to the circulation either by being liberated from their local point of attachment as in the case of the reticulo-endothelial cells, or by migration as in the case of the splenocytes and histiocytes. In 1898 Mallory had noted similar cells in a case of typhoid fever where he found them in the lymphoid tissues of the bowel, the mesenteric lymph nodes, the liver, spleen and in the pulmonary capillaries, as well as in the general circulation. He designated them "endothelial leucocytes," believing that they originated from the vascular and lymphatic endothelium at large.

The question arises as to whether all the large mononuclar cells of the blood are histiocytic in origin. Lewis and Lewis showed that these cells in incubated blood become transformed into macrophages, clasmatocytes, epithelioid cells and giant cells. Kiyono, by means of supra vital staining, showed that there were at least three types:

1. The blood histiocytes, intra-vitally stained as noted above.

2. The transitional cells of Ehrlich, supra-vitally stained, which apparently belong to the myeloid series.
3. Mononuclear cells which are also found in lymph vessels, apparently of lymphoid origin. These cells were neither intra-vitally nor supra-vitally stained.

Sabin, Doane and Cunningham used the supra-vital technique to distinguish the monocytes from other leucocytes. In their opinion the monocytes originate from reticular elements, particularly in the bone marrow and spleen. They believe that the same reticular cell is the specific stem cell from which all the leucocytes arise, polymorphonuclear leucocytes, lymphocytes and monocytes. The only blood cell which may cause confusion is the clasmatocyte which, however, may be distinguished from the monocyte by supra-vital staining. According to these observers there are four kinds of leucocytes in normal blood, polymorphonuclears, lymphocytes, monocytes and clasmatocytes.

Certain other cells exist, the relation of which to the reticulo-endothelial system is at present indeterminate. I refer to the true interstitial cells of the testis as opposed to the histiocytes occurring in the supporting stroma of this organ. These cells participate only to a minor degree in the storage of vital dyes and are probably best rejected from this system. They may be considered along with the fat cells, and the reticulum cells of the thymus as perhaps representing an accessory branch of the reticulo-endothelial system. On the other hand, Aschoff holds that the Rouget cells, which are similar in character to the adventitial cells, should be included.

In view of the difference of opinion regarding the identity of the reticular and endothelial cells, the free use of the term reticulo-endothelial cells is perhaps unfortunate. The use of the term reticulo-endothelial system, however, is not open to a similar objection because it includes as well the whole group of tissue mononuclear phagocytes. Sacks has defined the reticulo-endothelial system as consisting "of the reticulo-endothelial cells, i.e., reticular and endothelial cells, of the spleen, liver, bone marrow, lymph nodes, adrenal and hypophyseal capillaries, and the histiocytes (clasmatocytes and monocytes) of the tissues and the circulating blood." He suggests that, whereas the term "reticulo-endothelial cells" would serve as a collective name for all these elements, the terms reticular cells, endothelial cells, histiocytes, monocytes and clasmatocytes could be used to designate the individual elements wherever possible.

Such a system of reticulo-endothelial cells or histiocytes with its characteristic vital staining can be demonstrated throughout the entire animal series from the mammals to the cyclostomes, but the distribution and arrangement of the system varies considerably. For instance in birds, the main depot of the reticulo-endothelial system is in the liver, while only small aggregations of these cells are found in the spleen and bone marrow. In mammals the spleen is the headquarters of this system, but even among mammals each species exhibits its own peculiar arrangement. The inter-relationship between the various branches of the reticulo-endothelial system is also by no means constant. For example, following splenectomy in the rat or mouse, the Kupffer stellate cells react vigorously, while in the guinea pig and rabbit, very little reaction results. I have drawn attention to this variation in distribution and inter-reaction of the reticulo-endothelial cells in various animals because of its importance in the interpretation and application to the human of observations made upon experimental animals.

(This article will be concluded in the January issue.)

Protein Asthma: Nature and Diagnosis.

(H. K. Detweiler, M.D.)

The points brought out in the diagnosis and differential diagnosis of protein asthma may be summed up in the following table:—

Bronchitic Asthma.

More than fifty per cent. of all asthmatics fall into this group classified as bronchitic asthma. Although this group is well recognized, one finds very little concerning it in the literature. Almost all articles on asthma in the past ten years refer at length to protein asthma and pass over the bronchitic type in a very few words. The reason for this probably is that less is known about its etiology and less success has been attained in its treatment. The condition is sharply differentiated from protein asthma, not only by the absence of hyper-sensitivity (or allergy) with respect to any proteins, but also by the history of the course of the disease. In these cases it will almost invariably be found that a history of chronic bronchitis precedes the onset of the asthma. Often the bronchitis has been initiated by an attack of influenza, or a pneumonia which has not resolved in the usual satisfactory manner. It is true that one occasionally meets a case in which there is no demonstrable bronchitis, and all that can be found on examination is an ethmoiditis. It is this type which has been classified by some observers as a reflex asthma. I do not wish to deny its existence, but will merely point out that thorough examination almost always reveals a secondary infection in the lower respiratory tract. and it is therefore debatable as to whether they do not always have some infection in the bronchial tree even though it cannot be demonstrated.

In the case of asthma secondary to chronic bronchitis, physical examination between the attacks of asthma reveals evidence of diffuse bronchial discharge, such as harsh vesicular breath sounds with prolonged expiratory murmur, and scattered rhonchi throughout the chest. In long-standing cases there are all the signs of chronic pulmonary emphysema, the sputum is usually mucoid with some yellow or greenish material indicating purulency; this evidence of pyogenic infection may only be present in the early stages of each attack of bronchitis, and during the asthmatic attacks the sputum may be clear and jelly-like as found in protein asthma.

Eventually there comes a time in the course of protein asthma when all the signs enumerated above are present between the attacks, so that physical examination as a means of differentiation is only of value in early cases. An appreciation of this point will avoid many mistaken diagnoses.

Having finally decided that a given case belongs to the group of bronchitic asthma the next step is to ascertain in turn the cause of the bronchitis, as the successful treatment of the asthma will depend almost entirely on the measures taken to eliminate the infection in the bronchial tree. The following table will assist in the search for the etiological factor in the bronchitis:—

Causes of Chronic Bronchitis.

1. Focal infection, particularly in the upper respiratory tract.
2. Protein or cardiac asthma.
3. Arteriosclerosis usually associated with emphysema.
4. Mitral stenosis or myocardial disease.
5. Occupation—dust, etc.
6. Climate.
7. Tumors or aneurism pressing upon a bronchus.

8. Bronchiectasis.
9. Increased susceptibility of the bronchial mucosa to infection.

It follows, therefore, that a thorough search must be made for one or more of the factors emumerated above. In connection with focal infection it is my experience that infection about the gingival margins and the tonsils or accessory sinuses is of prime importance. Apical dental abscesses do not, in my opinion, have any direct bearing on the bronchitis or asthma, but of course may unfavorably influence the general health of the patient. The best criterion for condemning the tonsils is a history of recurring tonsillitis; next in importance to this are the evidences of chronic inflammation such as enlargement, excretion of fluid pus from the crypts on pressure, and the presence of enlarged lymphatic glands at the angles of the jaw. It is probable that accessory nasal sinus infection cannot be ruled out in some cases without the aid of X-Ray plates. Protein or cardiac asthma may cause chronic bronchitis by reason of the long continued irritation by the spasm in the bronchial musculature with turgescence of the mucous membrane, which eventually must lower the resistance of the bronchial tree and allow infection to take place. Usually this infection does not occur until the patient has suffered from asthma for a number of months or years. Arteriosclerosis of the pulmonary vessels associated with pulmonary emphysema is believed to be responsible for the onset of bronchial infection by reason of the altered circulatory condition. The same is true of myocardial disease or mitral stenosis, with chronic passive congestion of the lungs. Certain occupations, particularly those which expose the patient to irritating fumes, dusty atmospheres, wet or extremes of temperature are obviously liable to lead to bronchitis. The retained secretion and altered circulation of the bronchus distal to a tumor or aneurism pressing upon a bronchus usually result in localized infection. A bronchiectatic cavity serves constantly to re-infect the remainder of the bronchial tree, particularly on the same side. Finally in cases where all of the factors such as we have just we are forced, in accounting for the considered can be shown to be absent, presence of a chronic bronchitis, to the conclusion that in some patients the infection is due merely to an increased susceptibility of the bronchial mucous membrane to infection. In other words we are dealing here with a primary bronchitis. There is some evidence, however, which suggests that even in these cases we must remember the possibility of a portal of entry for bacteria apart from the general bronchial tree. Irons has suggested the tissues above the hila of the lungs as such a portal of entry. Of course this point, at least at present, is of academic interest only as such focus, or portal, can only be reached by bronchoscopy and direct treatment so far has not been found to be of much value.

Cardiac Asthma.

This type of asthma is not uncommon although its occurence is much less frequent than the types just described. It occurs most frequently in individuals past fifty years of age, and nearly always in persons known to be suffering from cardiac disease. The nature of the lesion in the heart is either a degenerative myocardial condition or a coronary sclerosis. Attention should be called to the necessity for differentiating between cardiac asthma and cardiac dyspnoea. In the former condition the administration of adrenalin affords prompt relief, as in other types of asthma, whereas in the more common condition of cardiac dyspnoea adrenalin has no effect since there is no spasm of the bronchial musculature.

The diagnosis of cardiac asthma, therefore, rests upon the presence of bronchial spasm, the onset of which has occurred after middle age. Such patients must show in the history either

disease in the myocardium or cardiac vessels. It must also be demonstrated that the patient is not a subject of protein sensitization or chronic bronchitis.

Treatment.

Since the line of treatment to be adopted in any given case of asthma depends so much upon the cause, I have purposely devoted much the larger part of this discussion to the methods of etiological diagnosis. Once the patient has been thoroughly investigated and the cause of his asthma ascertained the treatment suggests itself in most instances. The investigation requires time, and where the attack of asthma is actually in progress, one's attention must first be directed towards affording the patient temporary relief. An abundance of fresh air is important and this must be provided without the sufferer being allowed to become chilled. Avoid unnecessary conversation as the effort of talking or other exertion on the part of the patient increases the respiratory distress. Adrenalin chloride (1-1000) given hypodermically in a dose of from five to six minims, according to the size of the patient, will usually relieve the attack. Occasionally one will meet with a case in which adrenalin produces untoward symptoms, such as faintness, palpitation, tremor or even collapse. I have never heard of a fatal result, however, and in those individuals having slight symptoms I would not hesitate to use the drug when indicated. Atropine acts by paralyzing the vagus endings and in the few cases where adrenalin, which acts by stimulating the dilator fibres of the sympathetic, does not have the desired effect, or is contra-indicated for other reasons, atropine should be tried. Asthma powders, containing stramonium, belladona, hyoscyamus or lobelia leaves mixed with potassium nitrate to assist burning, are used a great deal and many patients obtain marked relief by their use. They tend to irritate the bronchial mucosa, thereby exciting an attack of coughing which seems to relieve the bronchial spasm to some extent. I feel that the use of asthma powders is justifiable where it is not practicable for the patient to have a hypodermic of adrenalin administered, but because of the irritating effect of the fumes, a bronchitis is apt to be set up or encouraged and thus harm as well as good may result.

Prevention of Recurrences.

Attacks of asthma can only be prevented with certainty when the cause has been discovered and removed. In the case of those asthmatics sensitized to protein this is often easily accomplished. Where the offending protein is contained in the food, such an article of diet should be omitted since attempts to desensitize these individuals must necessarily be laborious and time consuming and are not always successful. Prolonged abstinence, however, will often result in automatic desensitization. In cases where it is impossible to omit a food from the dietary the desensitization is accomplished by one of two methods. One is to feed the patient minute quantities of the offending food—quantities insufficient to cause a reaction. The amounts are gradually increased until the patient is able to take a reasonable serving without untoward effects. The other method has only been available recently, namely, the inoculation of the patient with gradual doses of protein solution, after the manner of hay fever treatment. These solutions have only recently been on the market and I have had no personal experience with their use. Both of these methods are time consuming and must be persisted in to obtain satisfactory results. In the case of animal emanations, avoidance of contact should be attempted; where this is impossible or insufficient, desensitization by inoculation with increasing doses of the offending protein will usually prove successful. In the writer's experience such active desensitization is most often necessary in the case

of horse dander sensitivity, less frequently in cases sensitive to feathers. From what has just been said it is obvious that sensitivity to feathers and house dust is best treated by the removal of pillows, cushions and eiderdowns from the rooms and sometimes from all the living quarters of the house; and the most thorough house cleaning so as to reduce dust to the absolute minimum. Bare floors are more easily kept free from dust than those covered by rugs or carpets; draperies should be eliminated as far as possible. In other words it is sometimes necessary to convert the patient's house, and particularly the patient's room, into a veritable hospital ward so far as furnishings are concerned. We have in the General Hospital at the present time an asthmatic who is sensitive to dust, who is now on her third admission. Her asthma leaves her almost immediately on reaching the hospital and she remains free. On returning to her home her symptoms recur within a few hours. Cooke describes the case of a girl living in a Y.W.C.A. dormitory whose sensitivity to dust was so great that the slightest laxity on the part of the chambermaid would result in an attack of asthma, and all that was necessary to relieve her was to remind the chambermaid of the importance of removing all dust from the room.

Pollen asthma is treated in the same manner as hay fever, namely, by inoculations with gradually increasing doses of the protein of the offending pollen *before* the season complained of. Such desensitization is not permanent, but must be repeated each year.

The treatment of the second type of case, the chronic bronchitic with asthma, must be directed towards relieving the bronchitis. Where focal infection in the upper respiratory tract exists, it must be treated, i.e. infected tonsils must be removed, pyorrhoea must be eliminated by treatment or removal of teeth where the process is very advanced. Infected antra must be washed out and infected sinuses drained. Often a polypoid condition of the mucous membrane may require attention. Vaccine treatment, using the organisms recovered from the patient's own secretions, either nasal or bronchial, has been a valuable aid in many cases. Occasionally the bacterial flora of the bronchial tree changes from time to time and the original vaccine may, under these circumstances, lose its efficacy. Thus it may be advantageous in refractory cases to make a new autogenous vaccine from time to time as required.

The treatment of cardiac asthma is essentially the treatment of the cardiac disease, although palliative measures which have been described in the other types may be applicable in these cases.

The drug treatment of asthma is assuming a place of less and less importance as our knowledge of causative factors increases. Nevertheless there is a real place for drug treatment, especially in refactory cases. Potassium or sodium iodide in doses of ten grains three or four times a day undoubtedly does seem to lessen the frequency and severity of attacks in many cases. I know patients who are relieved quite satisfactorily by five or ten grain doses of aspirin. The salicylates and iodides are the usual ingredients in the proprietary asthma remedies as shown by analyses turned out in various laboratories, and particularly in the laboratory of the American Medical Association. I think it is important for physicians to know the contents of these remedies, so as to inform their patients regarding these so-called cures, and in that way put a stop to the sale of ordinary drugs at exorbitant prices under the guise of patent asthma cures. Ephedrin has largely appeared on the market as a result of investigation carried out first in the Peking Union Medical College in China, and later on this continent, which goes to show that this drug possesses an adrenalin-like action in raising the blood pressure and relieving the smooth muscle spasm. Clini-

cal results obtained by the use of this drug in asthma are now being reported, and in general go to show that in doses averaging 0.05 grams every six hours, the asthma is either completely relieved or lessened in many cases. My own experience tends to corroborate this view, but I have seen some patients who were entirely refactory to the drug.

In conclusion there are certain general measures which are applicable to any type of asthma. It is important for these patients to avoid dust of any kind, but particularly house dust. Irritating fumes and smoke often precipitate an attack and should be avoided. The dust from a feather pillow may be important, even when the patient does not prove to have a sensitization to feathers. The diet should be simple, and the meals limited in quantity. Better five small meals a day than three large ones. Free catharsis is often followed by a marked alleviation of the distressing attacks and should be insisted upon. Elimination of waste products by skin and kidneys should also be encouraged. Climate is important only insofar as the presence or absence of offending protein in the atmosphere is concerned, or in the bronchitic types, insofar as the atmospheric conditions irritate or allay the bronchial infection.

Methods of Induction of Labour.

(C. B. White, B.A. (Cantab.), M.B.)

The methods of inducing labour may be grouped under the headings:

(1) Thermal agents.
(2) Electrical means.
(3) Mechanical means.
(4) Drugs.

In considering these, the points to note are:

(a) Whether or not they are safe.
(b) Whether they will produce the desired result in a reasonable amount of time.

The first two groups are seldom used now and it is not intended to consider them here. Mechanical means are:

1. Rupture of the membranes.
2. Packing vagina and cervix with gauze.
3. Metreurynter or introduction of hydrostatic bag into uterus.
4. Introduction of catheter or bougie into uterus.

Ruptures of Membranes.

This method was first described by Scheele. The technique is as follows: The patient is placed in the lithotomy position, usually under an anaesthetic, and the vulva is shaved. The position of the uterus is first ascertained, and then the vulva, vagina and cervix swabbed with 2½% iodine. A Sims speculum is inserted and the cervix brought down with a tenaculum. Avoiding touching the vagina if possible, a sterile sound is passed gently through the cervix and into the amniotic cavity in a direction corresponding to the position of the uterus, and the free escape of fluid ensured.

Objections:

(1) Results are uncertain.
(2) There is loss of the physiologic hydrostatic dilator, so that labour tends to be delayed. It is therefore wise to have a bag ready for use if there is excessive delay.
(3) It opens up an avenue for infection.

This is, however, the method of choice in acute hydramnios.

Gauze Packing.

The patient is prepared as for the previous method. A "packer" is pushed well up through the cervix, avoiding rupturing the membranes, and the ster-

ile iodoform gauze fed into the packer. The gauze is left in place until labour commences, but removed after twenty-four hours to avoid sepsis, if labour has not started by that time. Labour may commence at any time from one quarter to 36 hours. If the membranes are ruptured, it is wise to have a bag ready for use in case of delay.

Advantages:

(a) Does not require skilled or surgically clean assistant.

(b) When pains begin, progress is more nearly like normal and less painful than with a bag.

Disadvantages:

(a) Uncertainty and delay.

(b) Risk of infection.

This method is useful when there is not much dilation.

Bougie.

This method was first described by Krause. The bougies are slender gum-elastic rods, tapering towards one end, with a ball-like thickening at the other end. Some prefer the blunt type. The most serviceable sizes for induction of labour are sizes 28 or 30 (Fr). In sterilising, the bougies should not be boiled for longer than four minutes, or they will become too flexible. After boiling they should be placed in cold mercury bichloride, 1-4,000 solution.

The patient is prepared as before. The cervix is brought down with a tenaculum and the sterile bougie inserted into the canal, avoiding touching the vaginal wall. The bougie is then pushed up along the anterior uterine wall, between the amnion and the uterine wall, until the fundus is reached. Any early resistance is due to the placenta; in such a case the bougie should be removed and a new situation tried. A second bougie is placed beside the first.

The uterus usually begins to contract within 24-48 hours. If, after forty-eight hours, there are no pains, a third or fourth bougie should be inserted. The bougies should not be removed at the onset of the pains for if this is done, the pains may cease. They should be left in place at least until the os is fully dilated.

Before using a bougie, it should be ascertained that there is no infection in the passages.

Advantages:

(a) A very simple operation.

(b) May be used after drugs have failed.

Disadvantages:

(a) Stone states that the method frequently fails, but Eden and Holland state that it is always successful.

(b) Great uncertainty in time. Eden gives the average time before the onset of pains as seventy-five hours.

(c) Danger of carrying infection up from vulva.

The method is most successful during the last trimester.

Catheter.

This method is similar to Krause's, but a soft very flexible, rubber tube is used, which coils up in the lower uterine segment. of eighty-one cases in which this method was tried, Druskin reports failure in ten or twelve and a quarter per cent. as compared with two and one third using the bag. The average onset of pains was in nineteen and one third hours for primiparae, and twelve and three quarter hours for multiparae. The average duration of labour was twenty-five and three quarter hours for primiparae, and twenty-eight and one quarter hours for multiparae. He had sepsis in one case. He found that labour pains are more likely to cease before the birth of the foetus by this method than with a bag.

Hydrostatic Bag.

The most common type of hydrostatic bag is that of de Ribes. It is a pyriform bag of strong silk covered with rubber and curved, so that when in position, the broad end lies in the

lower uterine segment, above the brim of the pelvis. To the apex is attached a tube for filling, with a tap for retaining the fluid. The capacity is 400-500 c.c. To admit this the cervix must be at least one finger dilated, no anaesthetic will be required, but if less than this, then an anaesthetic is necessary.

The Voorhees bag is a modified form of de Ribes'. It is smaller and more conical and can be rolled up into a compact mass as a cigarette, so that an anaesthetic is rarely necessary. There are many other modifications.

The bags may be sterilised by boiling for ten minutes. Before using, the capacity should be determined. With the patient in the lithotomy position, the vagina is douched and the vulva, vagina and cervix swabbed with 2½% iodine. The bag is folded longitudinally, smeared with sterile vaseline, and, by means of a de Ribes' forceps, inserted into the lower uterine segment, well up above the internal os, and the forceps withdrawn. If the bag is not far enough in, it will escape from the vagina on filling and have to be replaced. A sterile solution, water being the simplest, is then run in, but the bag is not quite filled to its complete capacity. A weight of one pound may, if desired, be attached to the tube to augment the effect of the bag.

In placenta praevia, the membranes should first be ruptures, but this should be avoided in all other conditions, though no harm is done if the membranes are accidentally ruptured.

The bag acts as:

(a) Mechanical aid to dilatation.

(b) Dynamic stimulant to contraction.

(c) Preserver of membranes until physiologic rupture occurs.

Uterine contractions usually begin within a few hours. C. B. Reed reports that in his series, the average onset of pains was within three and a third hours and the average duration of labour eight hours, the shortest being one hour and the longest thirty hours. Druskin reports the onset of pains in primiparae as averaging ten hours and seven and a quarter hours in multiparae; while the duration of labour averaged fourteen and a half hours in primiparae and thirteen and a quarter hours in multiparae. He had only two failures in eighty-four cases or 97.6 per cent. success, with no cases of sepsis. In Reed's cases there was no postpartum infection in spite of positive cervical cultures in several cases. Watson reports success in 93.9 per cent. of cases.

Stone found that:

(a) The likelihood of spontaneous delivery following expulsion of the bag varies inversely with the size and development of the foetus.

(b) Version is the operation most frequently employed to effect final delivery and its incidence is practically the same at all periods of pregnancy.

(c) The incidence of minor operative procedure is not appreciably increased.

(d) The small number of primary cervical repairs suggests that the maternal soft tissues are not unduly traumatised by the procedure.

(e) The average time of expulsion is within the limits of reasonable promptness on one hand and conservative expectancy on the other, as compared with the results of accouchement forcé.

Druskin found that the action of the bag was enhanced by pituitary and also by two oz. castor oil several hours previously.

Advantages:

(1) It is a safe and simple procedure.

(2) It is very dependable and rarely fails. When once properly placed, dilatation of the canal almost always follows and spontaneous completion of the labour is the rule owing to the complete dilation.

(3) It accurately simulates the physiologic mechanics.

(4) It is applicable to a great number of case types.

(5) The maternal and foetal welfare is well assured by its use.

(6) It compares favourably with Caesarean section.

(7) It may be used when drugs have failed.

It is the method of choice in lateral or marginal placenta praevia.

Disadvantages:

(1) The bag forces the presenting part out of the pelvis, converting a potentially spontaneous into an operative labour, frequently requiring version after expulsion of the bag. On the other hand, after dilatation by the bag, manual correction is possible.

(2) Danger of carrying infection up from the vagina.

(3) Risk of leakage from or collapse tion and sepsis prejudices against Caesarean section afterwards if this is necessary.

(4) It is a foreign body in the cervix, obstructing drainage and causing traumatism and contusion.

(5) The pains tend to cease after expulsion of the bag.

(6) Risk of leakage from or collapse of the bag. In Reed's series, the bag broke in four and a half per cent.

(7) Tends to cause premature rupture of the membranes with associated liabilities.

(8) Patient requires close supervision owing to tendency of cord to prolapse.

Castor Oil, Quinine and Pituitrin.

This is the method advocated by Watson. The drugs are given as follows:

6 p.m. Castor oil, 1 oz.
7 p.m. Quinine hydrochloride, gr. x.
8 p.m. Hot soap suds enema.
9 p.m. Quinine hydrochloride, gr. x.
12 Quinine hydrochloride, gr. x.

If the patient complains of nausea or ringing in the ears, the quinine should be discontinued at once. If there are no labour pains after nine hours from the last dose of quinine, pituitary extract is given, ½ cc. deep into the muscle, and repeated every half hour up to six doses or until labour is induced.

If pituitrin is used alone, an enema is given until the rectum is clear, and then the pituitrin in ½ cc. doses repeated if necessary up to six doses.

Bailey claims that where this method has failed to produce any signs of labour within twelve hours, then bags or bougies should be used, but there is no reason why the medical method should not be attempted again once or twice.

Action of Quinine:

Gaggenheim performed experiments on the excised uteri of rats, showing that quinine increased the tone and rhythm of the uterine contractions if they were already present, but could not initiate contractions. The quinine had no power of dilating the cervix. His experiments were confirmed by Acton. In this connection, it is interesting to note that Fischer, studying the action of quinine in malarial women, found that it had never produced abortion.

Action of Castor Oil:

The action of the castor oil is probably to initiate the irritation and contraction of the uterus. Irritation of the bowel causes increased peristalsis and this disturbance is transmitted to the intestinal sympathetic centre, which is near the uterine centre, the latter becoming directly or indirectly affected.

Johnston claims that better results are obtained with castor oil and quinine on an empty stomach and that small doses are better than large. Muschallik claims success in 58.6 per cent. of 155 cases where quinine was given by mouth, and 52.2 per cent. successes in fifty cases where it was given intravenously or intramuscularly.

Action of Pituitrin:

Pituitrin has little effect on the inactive uterus but is very effective on the parturient uterus. Within 2-3 minutes after injection, extremely pow-

erful contractions begin, increasing in duration and frequency. Sometimes the uterus passes into a state of tonic contraction, so that it is wise to have an anaesthetic at hand. The effect of the drug only lasts 15-20 minutes.

All preparations of pituitrin are not of equal potency and it is better to employ regularly one reliable preparation only. Caution should be exercised in using it during the first stage. It should never be used without an exact knowledge of the relative size of the foetal head and the maternal pelvis. It should never be used when there is the slightest disproportion, where there is rigidity of the perineum or cervix, or where there are tumours. Watson states that pituitrin should only be used to stimulate uterine contraction when this is markedly inadequate and where we are absolutely satisfied that, given adequate contraction, there is no possible obstruction to the passage of the child.

Success.

	Cases	Success	
Without Pituitrin:			
Watson	185	55	29.7%
Williamson	300	140	46.6%
Muschallik	155	81	58.6%
Bailey	78	57	73%
Johnston	80	63	79%
With Pituitrin:			
Watson, 1920 ...	62	53	85%
Watson, 1922 ...	130	117	90%
Bailey			68%
Pituitrin Alone:			
Watson, 1922 ...	65	59	90.7%
Premature Labour: (1-4 weeks)			
Watson	49	37	75.5%
Johnston	27	22	81%

Bailey reports many successes.

Without pituitrin, the onset of labour comes on the average, 6-7 hours after the last dose of quinine. With pituitrin, it averages two hours from the first dose of pituitrin. Labour lasts on the average 10-11 hours in primiparae, and 6½-7 hours in multiparae.

In Watson's series, he had a foetal mortality of 6 per cent., the general foetal mortality for the corresponding six months being six and a half. He had no maternal mortality.

In Williamson's series, he states that the important factors in the successful cases were:

(a) The patients were due or past due.

(b) The head was fixed and beginning to engage.

(c) The cervix was partially or completely obliterated.

(d) The uterus was irritable and would easily contract on manipulation.

Advantages:

(1) No intrauterine interference and no risk of sepsis.

(2) No anaesthetics necessary.

(3) Less reluctance on the part of the patient.

(4) Does not in any way prejudice Caesarean section if this is necessary. Cases occur where it is considered advisable to attempt to induce labour first, though necessary perhaps to resort to Caesarean section later, in which case, risk of sepsis is after the Caesarean section is increased by vaginal interference beforehand.

Disadvantages:

(1) Frequently fails.

(2) May cause premature separation of the placenta.

(3) It is claimed that it raises the blood pressure and therefore is contraindicated especially in toxaemic cases, but Lailey has shown that the first dose of pituitrin never raises the blood pressure more than five points, and subsequent doses do not raise it any higher.

(4) Intracranial injury and haemorrhage in the foetus may be caused by the head being forced too rapidly by the powerful uterine contraction, past a rigid vulva and perineum.

(5) Asphyxiation of the child may result from tonic contraction.

(6) Cases have been reported of rup-

ture of the uterus. Watson claims that the initial contraction is never of a severe tonic nature when the drug is properly administered and that this last accident is sure to occur when the drug is improperly used, viz: with rigid cervix, delay due to small pelvis, large head, malposition of head or with rigid pelvix floor.

Conclusion.

In special cases one definite method of inducing labour is indicated, such as:

Rupture of membranes in hydramnios.

Bag in lateral or marginal placenta praevia.

In general, however, when premature induction is indicated, there is a choice of several methods. It seems that in urgent cases the hydrostatic bag is the surest and most rapid method of inducing labour. In non-urgent cases, however, the advantage lies with the medicinal method owing to lack of risk of sepsis. Unless urgent, non-mechanical means may be tried first in every case. Quite an appreciable number will go into labour and labour so induced is safer than the mechanically induced; mechanical methods may still be used if it fails. If it fails nothing is amiss, but if it is successful, labour has been induced easily without undue distress to the mother. It should be remembered, however, that pituitrin is a powerful drug and accidents have occurred where it has been used inadvisably.

Deformities of Lower Extremities in Children.

(By Marion D. Laird, B.A., 2T8.)

Definition.

"Deformity is unnatural growth or distorted or misshapen part or member."

Deformities occurred as far back as we have record of man, as congenital or acquired. The ancient Spartans abolished results of congenital deformity by exposing all defective infants on a high mountain near the city. But in the last few centuries orthopaedic surgery has become an important science. Andry, who first coined the word from "orthos" straight and "pais" meaning child, considered the prevention and correction of deformities in children only. Now orthopaedic surgery comprises surgery of apparatus of locomotion in three aspects:—etiological, prophylactic, and therapeutic.

Congenital.

Two groups commonly seen are congenital dislocations and congenital disease.

Dislocations.—Congenital dislocation of the hip is more commonly unilateral and is seen more frequently in girls than boys. The cause is uncertain and deformities are often not discovered until the child begins to walk. The limb is shortened and flexed on pelvis causing a limp. Gradually produces lordosis and scoliosis. Changes are seen in normal relations in Nelaton's line and Bryant's triangle. There is adduction of the lower part of the femur and the gait is typically waddling. The condition of the joint at birth is as follows: Head of femur is small and flat, the neck short, the acetabulum shallow and small, and the capsule large. If walking is allowed, the head becomes more displaced and flatter, the capsule stretched and thickened, the ligamentum teres longer, acetabulum triangular and muscles modified. A new and higher acetabulum will be formed where the femoral head rides on the ilium. If this patient carries on, he will very probably have osteoarthritis in the third decade.

Treatment is by manipulation or by open operation.

(a) *Manipulation* is the treatment of choice in young children. In the *Lorenz* method the head is brought down as follows: Limb is flexed, abducted, extended and everted, while pressure is applied behind the head, pushing upwards. This manoeuver is repeated and limb is put up in a plaster spica in this abducted position for twelve weeks. The plaster is then removed, the amount of abduction decreased, and a second plaster applied. The patient is allowed to walk. Five to nine months is usually the total period in plaster. A period of massage and exercise follows. The result is good in children from three to six years of age.

(b) *Open Operation* is preceded by similar manipulation and splinting of the limb in abduction for a few weeks? Then, through an anterior incision the acetabulum is enlarged and the head of the femur replaced in it, and the capsule closed. An osteoperiosteal flap is arranged to increase the size of the upper lip of the acetabulum. The limb is put up in plaster in position of abduction for six months. The child is allowed to walk after the first eight weeks.

There are a number of common deformities which may be either congenital or acquired.

Coxa Vara.—This is a condition in which the neck of the femur makes an angle of less than 125° with the shaft.

Etiology: Osteomalacia, fibrocystic disease, rickets and heavy carrying or walking; traumatic separation of epiphysis; fracture and yielded callus; osteitis deformans; idiopathic.

The condition is usually unilateral and more common in boys than in girls. The neck of the femur is shortened and the head flattened due to an interstitial absorption of bone.

1. Adolescent or epiphyseal coxa vara.—Onset is insidious but usually after an injury. Patient limps and has pain in the thigh referred to the knee. Limb is adducted and everted and movement temporarily limited by muscle spasm. Later there is permanent limitation of movement with wasting, abduction and internal rotation of limb. There is real shortening which can be shown to be in the neck of the femur. It is important to differentiate from tuberculosis of hip, by history, physical signs and X-ray.

2. Infantile or Cervical coxa vara is found in boys as commonly as in girls and is often bilateral. Up to eight years of age a peculiar gait is noticed when the child walks. The limb is flexed and adducted and there is limitation of abduction and external rotation but no complete loss of movement. The limb shortens, producing a lordosis. X-ray shows the neck making an acute angle with the shaft and a fibrous tissue intersection.

3. Congenital.—There is usually some associated deformity as in the infantile type.

4. Rickety coxa vara is due to a curve through the neck and the shaft.

Treatment may be carried out according to the severity and duration of the deformity.

(1) In early cases a caliper walking splint prevents deformity.

(2) In young children, prolonged extension, inversion and abduction may produce a cure.

(3) Subtrochanteric osteotomy with tenotomy of adductors may be necessary.

(4) Removal of head of femur when other methods are not sufficient.

Coxa Valga is an increase in the angle between the neck and shaft of the femur. It is usually caused by congenital dislocation of the hip or by infantile paralysis. The limb is abducted and everted and there is limitation of adduction and inversion. The great trochanter is lower than normal. Treat cause if possible or when necessary do a subtrochanteric osteotomy.

Genu Recurvatum or Hyperextension of Kene, is caused by congenital displacement, paralysis of flexors of knee

and of popliteus; Charcot's disease of knee-joint; irregular growth at epiphyseal line. The crucial ligaments must be very loose to allow this condition, and it should be treated according to individual cases.

Talipes Equino Varus is most commonly congenital, but it may be due to flaccid paralysis of peroneal and extensor muscles, or to spastic paralysis, or to scarring. This deformity is a fairly common result of infantile paralysis. There is an inversion of the fore part of the foot at the mid-tarsal joint, the scaphoid is displaced in and down on the astragalus, the upper and outer part of the astragalus being uncovered, the foot is plantar flexed. The tibialis posticus and tendo Achillis are shortened, peronei and long extensors are stretched; and the inner inferior ligaments are contracted. The diagnosis depends on the history, the typical deformity, the weak muscles and cold foot. The deformity should be prevented by splints as soon as muscles are paralysed. Later, the congenital and paralytic types may be treated by manipulation and splinting. Operative treatment in patients twelve years and over may be in two steps. (1) Adduction and inversion corrected, and patient in cast for six weeks. (2) Correct equinus by cutting or transplanting tendo Achillis and cutting plantar fascia. Several difficulties are met with. Undue resistance may be overcome by Thomas' wrench; persistent inversion by walking apparatus, or osteotomy or osteoclasis of tibia; failure of paralysed muscles to regain power may be overcome by transplantation of tendon of tibialis anterior to cuboid.

Talipes varus is corrected by the *Hoke* operation to stabilize the foot. The head of the talus is moulded, tibia is cut and lower part externally rotated and plaster is applied with foot dorsiflexed, everted, and externally rotated.

Talipes Equinus is rarely congenital, but more often due to anterior poliomyelitis, contraction of tendo Achillis, scarring or fracture in ankle region, producing other contraction or bone deformity. This injury is frequently a displacement of one fore part of foot at the mid-tarsal joint. Correction is made by lengthening of tendo Achillis, followed by wrenching if necessary. Bayer has done a subcutaneous lengthening by cutting half way through tendon from inner side and half through on outer side at a different point and subsequent stretching. Especially in a spastic limb the tendon should never be divided.

Talipes Calcaneus may be congenital, accompanying spina bifida, or it may be due to paralysis of gastrocnemius and soleus when it is usually accompanied by a valgus deformity. If calcaneus is neglected, a pes cavus results. This should be prevented by prolonged plantar flexion. If this is not sufficient, transplant flexor and peroneus longus tendons into insertion of tendo Achillis, using tendo Achillis for a posterior ligament. In older cases with cavus deformity, Whitman's operation is good. Remove the astragalus and displace foot backwards until internal malleolus is on scaphoid and external on calcaneo-cuboid joint. This ensures stability and weight is carried on arch of foot. Arthrodesis is not so good.

Pes Cavus is usually acquired during childhood or adolescence due to paresis of peronei, interossei and lumbrical muscles. Unilateral condition is caused by anterior poliomyelitis, bilateral; by progressive muscular atrophy and Friedrich's ataxia, rheumatoid arthritis. Tight, high-heeled boots may produce cavus deformity. The anterior arch is short, broad and high, accompanied by claw toes and often no metatarsal varus or talipes equino-varus. Diagnosis is made by typical position of foot, pain and callosities over heads of metatarsals, and corns on claw toes. Care and massage may cure a moderate deformity. Movement of stiff joints under an anaesthetic may be necessary, followed by massage. In more severe case, tenotomy and wrenching are required and foot is put up in plaster in corrected position.

Flat Foot and Weak Foot is produced by diminution or loss of internal longitudinal arch, usually with some valgus. The child developes the arch by walking, so flat foot may be due to late development of arch, it may be congenital, a sequela of rickets, or in older children and adolescents caused by a painful spot on the foot or by hallux rigidus. Diagnosis is made by patient's foot prints. Three degrees of flat foot are recognized (1) tibial muscles can pull up arch when foot is in tip-toe position. (2) Inversion by surgeon produces arch. (3) Inversion impossible due to muscular rigidity, periarticular adhesions or bone deformity. In children there is usually no pain or disability, but advice is sought on account of the deformity or the toe-in habit. Treatment consists in removing cause, if possible, followed by reduction through the three degrees. Rigidity is overcome by rest or manipulation, or foot is fully inverted in cast until spasm gone. Support arch by a fitted boot or moulded support and give exercises as soon as possible. Prognosis will be very good in children.

Inflammation.

Tuberculous Arthritis. In the cases of tuberculous arthritis at H.S.C., Edinburgh, 40 per cent. were in the hip joint and 30 per cent. at the knee. This is probably due to the exposure to injury and the rapid growth at these joints. Four types are found, acute miliary, chronic, granulating and fibrous tuberculous synovitis. If untreated, three results are possible: (1) fibrosis of synovial membrane with little disability; (2) destruction of cartilage, producing ankylosis; (3) destruction of cartilage producing osseous ankylosis.

The patient usually has a history of trauma and general malaise and night cries. The joint is stiff and there is limitation of movement, deformity, and wasting of the limb. The condition is usually monarticular. It must be differentiated from:

1. Traumatic arthritis.
2. Infective arthritis.
3. Syphilitic arthritis—the *congenital* condition is an osteo-*gummatous syphilis* commonly affects the knee joint—there is mobility, no pain and positive Wasserman.
4. Still's disease—or proliferative rheumatoid arthritis, a polyarthritis producing stiffness and muscular atrophy. The spleen and lymph glands are enlarged.
5. Anterior poliomyelitis— produces pain, tenderness and immobility, and later paralysis is prominent.
6. Hysterical arthritis—seen just before puberty.
7. Periarticular bursitis.

Hip—Complete recovery is unusual and results range from merely limitation of movement to complete ankylosis, shortening or adduction, depending on condition of joint when diagnosed; thoroughness and efficiency of treatment, severity of disease and presence of complications, resistance and age of child.

Knee—These remarks also apply to the knee and prognosis is always poor when flexion and backward displacement of the tibia are present. Occurrence of suppuration produces ankylosis and amyloid degeneration and often necessitates amputation.

Ankle—Tuberculosis arthritis of ankle usually causes adjacent bone disease, cold abcess or intertarsal arthritis and has a poor prognosis.

Treatment in general is plenty of fresh air and sunlight, correction of deformity and fixation, and similar treatment of adjacent disease. Operation is indicated in progressive disease where conservative treatment is not practicable, and where there is mixed infection in a joint. The operation is radical excision of the joint to produce bony ankylosis.

Syphilis of bones in children is usually congenital.

Bones.

Rickets is a disease of bone which is responsible for several common deformities in the lower extremity. It is seen in children and is caused by deficiency in diet of fat soluble A vitamine. The result is a hypotonia of muscles, laxity of joint capsule, enlargement of epiphyseal ends of long bones, increased vascularity and increased malleability of bones. Thus weight, muscle, pull, and incorrect position easily produce deformity, such as (1) shortening from decreased growth; (2) easy fracture with poor union; (3) bending or twisting of long bones, sabre legs, coxa vara, genu valgum, bowlegs, flat foot, etc. Treatment is, in general, by splints, in children under four years, and by gradual manipulation; by osteoclasis and by osteotomy.

Coxa Vara has already been dealt with under congenital deformities.

Genu Valgum, or Knock Knee, is a condition in which the femur and tibia form an angle opening outwards. It is the commonest of deformities of childhood, is more frequent in boys than girls, and usually bilateral. In children 2 to 5 years, knock knee is caused by rickets; from 12-15 years we see the adolescent type; it is also caused by contraction of biceps in paralysed legs; and by contraction of muscle, loss of ligaments and articular surfaces in tuberculous knee. The two latter conditions have also some flexion at knee and posterior displacement of tibia.

In rickets the deformity is a curvature of shafts of femur and tibia. In the adolescent there is abnormal obliquity of articular surfaces and enlargement of internal condyle of femur. In these two conditions, deformity disappears with flexion of the knee. A slight degree of knock knee is common in young children, and disappears; a greater degree in young child or in period 12-14 years will be permanent and later on will predispose to degenerative osteoarthritis.

A mild case may be corrected by a lift on inner side of boot and suitable exercises. A more severe case, perhaps due to active rickets, should have mechanical support such as the Thomas knock knee brace. The still more severe case may be operated upon after four years of age. McEwen's osteotomy is done on the femur above the adductor tubercle and limb is put in plaster for 6-8 weeks. Biceps is cut and osteotomy of tibia is done, if necessary.

Genu Varum and bowed tibia is a frequent sequela of rickets and may be increased at adolescence. Bowing occurs at lower end of tibia first, with no pain, inflammatory signs or anterior thickening of bone. A posterior buttressing may be felt, and is seen in X-ray. The condition is treated by manipulation and splinting up to four years of age. If not improving, operation is indicated. Inward concavity of tibia (4-5 years) corrected by osteoclasis and fixation in plaster one month; or by a high osteotomy. On anterior convexity is treated by cuneiform osteotomy. The deformity of the femur is similarly dealt with later.

Nerve.

Paralysis due to nerve lesions are frequently the cause of deformity. Paralysis may be (a) Cerebral or spastic; (b) Flaccid; (c) due to peripheral nerve lesion; (d) congenital.

Spastic Paralysis is caused by a lesion of the upper motor neurone. The deformity results from contraction of the stronger group of muscles, and from loss of control of affected muscles causing inco-ordination. The condition may take the form of hemiplegia, monoplegia, paraplegia, or diplegia. Causes of upper motor neurone lesions are:

1. Developmental Defect.
2. Injury or haemorrhage at birth.
3. Post natal inflammation or polioencephalitis, also seen in cengenital syphilis and deformity, is not noticed until the child is several months old.

4. Congenital or acquired hydrocephalus.
5. Injuries to the head in childhood. A lesion at the vertex of the cerebrum produces lower limb paraplegia.

There may be an acute stage of the disease with convulsions producing hemiplegia, or local muscular spasticity, inco-ordination, athetosis, and epilepsy may be the findings. In the typical deformity of the lower limb, the thigh is adducted, flexed and internally rotated, knee flexed and foot in equinovarus position. Sometimes other variations are seen as calcaneo-valgus, etc. The deformity may be temporarily corrected by pressure in young children. Tendon reflexes are exaggerated, superficial reflexes lost, ankle clonus and extensor plantar response are seen. The gait is characteristic, with knees crossed. The mental status is also usually abnormal and improvement of the limb may cause mental improvement. Epilepsy is seen in the acquired cases. The treatment is to relieve the spasm and train co-ordination. Operations have been devised for lengthening or dividing tendons. The adductor tendons are divided either by subcutaneous or open method and the tensor fasciae femoris and anterior part of gluteus medius are cut to abolish inversion. The hamstrings are divided at the knee; the tendo-Achillis is lengthened and the whole limb placed in a cast in corrected position for six weeks. For co-ordination training; the patient should be at least seven years of age, and active movements are best.

Stoffel has worked out the anatomy of the nerves affected and injects alcohol which produces flaccid paralysis for six weeks, giving the opposing muscles a rest and a chance to regain strength.

Foster has done a section of posterior roots which has restored limbs which have resisted other methods. Secondary contractures still need manipulation and splints.

Friedrich's ataxia due to progressive sclerosis of posterior and lateral columns is characterized by inco-ordination of the limbs, but no real hypertonicity.

Spastic spinal paraplegia has a poorer prognosis than the cerebral but may be improved by sympathetic rami-section.

Flaccid Paralysis.—Anterior poliomyelitis is an acute infection chiefly in young children affecting anterior horn cells and causing more or less extensive flaccid paralysis. The acute stage of fever, etc., is short and paralysis usually appears after this, increasing during three or four days. There is spontaneous recovery to a greater or less degree. Early in the disease atrophy of affected muscles occurs and the limb is cold and blue. Contractures arise during the stage of recovery, due to shortening of healthy, partially paralysed or recovered muscles. Contracture may arise six weeks or six months after the attack. For treatment, it is necessary to discover the amount of paralysis in various muscles affected and the presence of any fixed contracture. Then the affected muscles must be protected and prevented from overstretching, allowed to do what little work is possible and their nutrition must be maintained. The best position for the lower limb is full extension of the hip and knee, dorsiflexion of foot to a right angle and slight inversion. Walking, suitable exercises and massage should be started early. Only after two years should the residual paralysis be considered permanent. Deformities in neglected cases may be treated as follows:—

1. By splinting and pressure.
2. By tenotomy or tendon lengthening.
3. By force during an anaesthetic.

The typical deformity is flexion contracture at hip and knee and equinus position of foot. After correction, a retention apparatus must be supplied for two years at least. After this, tendon transplantation and arthrodesis may be necessary to produce a useful limb.

Metatarsalgia or Morton's disease is

spasmodic pain over the head of the fourth metatarsal which spreads over the fourth toe and then through the whole foot. The pain is severe enough to prevent walking and may be increased by compressing the foot laterally and pressing down the fourth metatarsal. It may be spontaneous or after an injury and is caused by nipping the digital nerve between the metatarsal heads. A suitable support may be palliative but excision of the head of the fourth metatarsal cures the condition.

Bibliography.

Gask and Wilson: Surgery.

John Fraser: Surgery of Childhood, 1926.

Q. H. Tubby: Deformities Including Diseases of Bones and Joints, 1912.

Rose and Carless: Surgery.

Journal of Bone and Joint Surgery.

Leukorrhoea.*

(Homer Bull, M.B.)

Leukorrhoea is defined differently by different authorities.

1. Burns defines leukorrhoea as a hypersecretion of the cervical glands and a hyper exudation from the vagina, of the normal secretions of the cervix and vagina. These he divides into physiological and pathological according to etiology.

2. Crossen defines leukorrhoea as any variety of pathologic discharge from the genitals except discharges containing blocd. He also classifies the symptom according to its primary cause.

3. Munro Kerr says, leukorrhoea should include only those conditions in which there is merely an excessive amount of the normal whitish secretion, referred to by the patients as "whites." This corresponds clearly with the definition of Burns.

In dealing with the symptom termed leukorrhoea, the writer will include all discharges from the vagina execept discharges containing blood, whether of physiological, or pathological origin or constitution.

The Normal Secretion of the female genitals is composed of three parts, cervical, vaginal and uterine. The cervical secretion is thick mucoid in character, and resembles egg albumen, and is alkaline in reaction. The vaginal exudate is thin, white, and milky, and is acid in reaction. In pregnancy it may be curdy. The secretion of the endometrium is watery and thin, and is not regarded as one of importance by many writers.

When present in normal amounts, this secretion serves as a lubricant for the vagina and external genitalia. The normal intermenstrual period is free from any discharge. Leukorrhoea is said by Burns to be normal when associated with menstruation, coitus and pregnancy, and requires no treatment. It is said to be pathological when it lasts for an undue length of time or is very frequently induced, yet is of normal constitution. That associated with tumors of the uterus and adnexae, such as fibroids and ovarian tumors or tuberculosis, is persistent in type, while that associated with masturbation and constipation is of the type frequently or irregularly induced.

The most important type is that associated with inflammatory conditions of the genital tract, in which the discharge may lose these characteristics, become yellow and resemble pus. It may contain pus cells, bacteria, epithelial debris, and is profuse in amount and irritating to the external genitalia, and may be offensive in odour. This is the type which gives us the most concern and is the most difficult to deal with.

Diagnosis has to do with differentiation of diseases which give rise to the

*Gynaecological Thesis 1926-27.

symptom of leukorrhoea, so it is of value to study the microscopic structure of the constituents of the discharge. History and physical examination are important factors in diagnosis. It will be noted that treatment must depend entirely on the cause of the symptoms.

Explanation of the *physiological* cause of normal leukorrhoea is readily given. In the premenstrual and postmenstrual period the endometrium, and in fact, all the pelvic organs are congested, which results in a hypersecretion of all glands in the pelvic viscera.

In reference to leukorrhoea caused by *coitus,* [4]Rubin states, that the role of the cervical mucous secretion is especially to further the activity of spermatozoa, and their entrance into the uterus. He also states that the secretions from the sebaceous glands of the vulva, Bartholin's secretion, and that from the Skene's ducts, all appear to be increased and subject to psychic influence. Young women come complaining of weakness, which they attribute to this watery saliva-like discharge. They are found to be the type who respond readily to sex stimulation. A hypermia of the genitals is thus psychically produced, and results in a discharge from Bartholin's glands and also at the height of the orgasm from the cervical plands ([4]Rubin).

Leukorrhoea associated with *pregnancy* and classified as physiological is persistent in type. It sometimes gives rise to much discomfort, especially in stout women. The external genitals, folds of the groin and inner sides of the thigh become sodden and irritated from rubbing. This is the only type of physiological leukorrhoea, which calls for treatment.

In dealing with the group of cases classified by [1]Burns as *"pathological"* we might for greater exactness name this class "pathological *non-inflammatory* leukorrhoea."

The first subdivision of this group may be said to deal with those cases of leukorrhoea, which are found in *anemic and debilitated patients,* or due to congestion of the pelvis from any cause. Constipation is mentioned as being an important causative factor in leukorrhoea; and it is said to cause a marked degree of secondary anaemia, which will be cleared up by the relief of the constipation, and the leukorrhoea will automatically disappear. Tuberculosis, heart disease, diabetes, and other general debilitating disease will give rise to a more or less persistent type of leukorrhoea, which is cured usually by the relief of the primary cause. These causes can be classed as extra genital, ([2]Crossen).

Masturbation plays no small role in the causation of leukorrhoea in young persons. [5]Kelly states that 33.9 per cent. of public and private cases, suffering from a leukorrhoea discharge, showed evidence in the external genitalia of masturbation. Most of these cases exhibit the clinical evidence of the habit, well developed clitoris, buried beneath the adherent prepuce, a symmetrical enlargement of the labia minora and enlargement of the veins of the vulva. These patients complain of leukorrhoea, pruritis vulvae, dysmenorrhoea and bladder irritation. The endometrium is found to be thickened and luxuriant, resembling that found associated with fibroids. Periods come closer together, if the habit is persisted in over a long period of time.

Foreign Bodies, such as pessaries and certain forms of contraceptives as the metal stud are causative factors. These are forms of direct irritants. Douching also falls in this group as a cause of leukorrhoea.

Disturbed Pelvic Mechanics is a common cause of leukorrhoea. Retro-displacements, ante-flexion and prolapse of the uterus are important alone, as well as in association with old cervical lacerations, in which cases the endocervical mucous membrane spreads outwards along the scars. Relief of these conditions is replacement and repair.

Tumors of the Uterus and adnexae are nearly always found to have, as an early symptom, leukorrhoea of a persistent

type, due to an increased pelvic congestion.

Partial Atresia or Stenosis of the vagina, as described by [6]Graves, sets up an irritating condition in the vagina, which causes leukorrhoea, and is relieved by breaking down the adhesions.

Ascaris in Children may give rise to troublesome persistent leukorrhoea.

Neglect of Cleanliness is given by [7]Reder as a cause in children, relieved by bathing.

Subinvolution and hyperinvolution of the uterus are cited as causes by [8]Barton.

Leukorrhoea of inflammatory origin is definitely pathological in most of the cases experienced. Perhaps the commonest cause of a persistent leukorrhoea is *gonorrhoea.* In the acute stage it is frequently true vulvo-vaginitis and most commonly an acute endocervicitis. Urethritis is the rule, with infection in Skene's ducts. Bartholin's ducts become infected and also the glands of the cervical canal, which are not protected by a submucosa but lie immediately beneath the mucosa. The discharge is yellowish in colour, and gram-negative intracellular diplococci are found in the smears from the urethra and cervix. The cervix and vulva, and to a degree the vagina, are acutely inflamed and congested, resulting in a leukorrhoea. This stage often passes into one of chronicity, the vulva and vagina clearing up more or less quickly and the infection remains in the glands of the cervix to give rise to a persistent leukorrhoea of cervical origin due to its irritating action. Gonorrhoeal vaginitis is frequently found in children who are exposed to nursemaids, etc.

Ulcers of the Vulva, vagina or cervix, may be simple, chancroidal, syphilitic, tuberculous or malignant and give rise to a leukorrhoea. Each condition must be treated according to its etiology.

Adhesive vaginitis is found near or after the menopause. The discharge is sticky "gluey" in character; and the vaginal walls are adherent at different spots. A leukorrhoea results.

Occasionally in unmarried women a leukorrhoea discharge of a very foul character may be found. Bacteriological investigation of the uterine cavity has shown B. Coli in some cases and staphylococci in others. This is a *chronic endometritis* and does not usually appear until later on in the reproductive period of life.

Salpingitis usually gonococcal in origin, *cellulitis,* or *pelvic peritonitis,* are causative factors in a chronic leukorrhoea.

In Septic Endometritis a copious discharge is found.

In Malignant Disease of the uterus or cervix leukorrhoea watery, serous, serosanguinous or foul in character is an early sign, later complicated by ulceration and infection.

The Pathology of Leukorrhoea is the pathology of the causative factor. However there is one type which may be dealt with conveniently in this brief review of causes and treatment. This is the persistent leukorrhoea, which is not amenable to any of the specific and general forms of treatment which are first used to cure the malady. It is the chronic type which [9]Curtis describes concisely. "Hypertrophic cervical glands are a most important factor in chronic leukorrhoea." in 96 per cent. of cases, he found gland hypertrophy and signs of chronic inflammation. In addition to plasma cells, and other round cells, the microscope revealed abundant polymorphonuclear leucocyte infiltration.. [9]Curtis also noticed the relationship of chronic leukorrhoea to focal infection. Chronic arthritis he noticed with unexpected frequency in patients without other demonstrable foci; the regions most involved are the lower spine, sacroiliac joints and the finger joints. Many of these cases had a history of a previous gonococcal infection. The condition is a true chronic endocervicitis, and may involve the vaginal portion as well as the supravaginal part of the cervix.

Treatment varies as does the pathology.

In *physiological cases* of leukorrhoea no treatment is called for, except in association with pregnancy in stout women, where the discharge becomes very irritating. Packing the vagina with gauze soaked in acriflavine (1-100) once a week, leaving the pack in for twenty-four hours is often efficacious. The parts should be washed night and morning with warm water and soap, thoroughly dried and mopped with Spirit. Vini-Meth., or eau de cologne, and dusted with some simple dusting powder. ([1]Burns.)

Under the heading of the *non-inflammatory pathological type* comes leukorrhoea of extra-genital origin. In general debilitating diseases, anaemia, and constipation, the nutrition, environment and general health must be attended to and the leukorrhoea will usually disappear. Constipation is an important factor and must be dealt with.

Masturbation requires some consideration. Its cure depends on several factors, eradication of the habit, and local treatment. Advice, fresh air, fatigue, cold baths, rising early in the morning, general tonic treatment and avoidance of stimulants aid in the eradication of the habit. Removal of the source of irritation, by freeing the clitoris, amputating the labia minora, and extreme cleanliness of the genitals is very valuable

In the case of *foreign bodies,* remove the exciting cause and pack the vagina with gauze soaked in some non-irritating antiseptic such as acriflavine. Packing is left in twenty-four hours, and repeated twice weekly for three weeks. ([1]Burns.)

Disturbed Pelvic Mechanics, tumors and atresia of the vagina all call for operative procedures.

Ascaris in Children should be treated with cascara; two teaspoonfuls at night, santonin, gr ½ at 9 a.m. Omit lunch. Castor oil, 2 teaspoonfuls at 12.30 noon.

Treatment of Leukorrhoea of inflammatory Origin deals chiefly with acute and chronic endocervicitis, urethritis, vulvitis, vaginitis, salpingitis, pelvic cellulitis, peritonitis, and infected and ulcerated new growths including necrotic fibroids and carcinomata. The most difficult to treat is the type of chronic leukorrhoea due to *chronic endocervicitis* described by [9]Curtis and others.

In the *acute inflamatory stage* of vulvitis or cervicitis, the treatment is that of acute gonorrhoea, which is entirely local in its application and consists in the application of antiseptics of different types and strengths, and in the observance of the utmost cleanliness of the parts. The towels and linen should be kept isolated. Sanitary towels should be worn to protect the clothing and sitz baths containing some antiseptic such as creolin or potassium permanganate should be used two or three times daily during the acute stage. Once daily the external genitalia should be thoroughly cleansed and then each infected area should be treated with a three to five per cent. silver nitrate solution (or some other silver preparation such as argyrol, protargol or neosilvol), the application being made on fine probes covered with cotton wool. Where there is a Bartholin's abscess it should be aspirated, and a weak solution of silver nitrate (2 per cent) injected. The urethra should be washed out with a solution of 1-5000 potassium permanganate, or 1-2000 silver nitrate daily. The vagina should be swabbed out with 1-2000 mercuric biniodide, or one per cent lactic acid. The cervix must be painted with a 2 per cent. silver nitrate and the external os must be sufficiently dilated to allow drainage. Cultures of lactic acid bacilli may be inserted into the vagina and left to keep the content and flow acid in reaction, which hinders the growth of the gonococci.

Ulcers of the Vulva, Vagina or Cervix are treated according to the causative agent. 10 per cent. silver nitrate is used in many instances to swab the ulcer.

Adhesive Vaginitis may be helped by the use of vaginal douches of 5 per cent. soda bicarb solution.

In the cases of a *foul discharge* from unmarried women, curettage may have

to be resorted to. Dilatation of the cervix usually helps and douches as above.

In the chronic persistent type of leukorrhoea, due to a chronic inflammatory process in the cervix with resultant hypertrophy of the Nabothian cervical glands, the treatment is diverse and, it has been attended by varying degrees of success.

Curettage treatment to the uterine cavity, applications to the lower cervix, vaginal douches, administration of glycerine or other hygroscopic substances, vaginal tampons, various kinds of powders, and vaccines have all been used and some are still being used with varying degrees of success.

Constipation is relieved and diet and general health first attended to.

Lactic Acid Bacillus in the vagina, on tampons or in douches, will render the vagina acid in three or four weeks and will oftentimes cure leukorrhoea in senile cases with intolerable pruritis. ([1]Burns) and ([10]Black and Llewellyn.)

A *powder* is used by [11]Steward to cover the cervix. Tampons are inserted over it. Sublamine gr. 2 Sod. Citrate gr. 40. Alum drachms 3 Sod. Chloride Oz. ½. Lead Acetate dr. 6, Sugar Q.S. ad Oz. 16. Douche first with thirty-six per cent. lactic acid and use this powder three times per week. He claims some success with this treatment.

[9]Curtis ascribes the cause of *chronic endocervicitis* to streptococcus in thirty per cent. of cases and gonococcus in most other cases. Autogenous vaccines are sometimes useful.

Of the Medical Remedies the most popular are iodine and the silver salts, but Curtis claims formalin is superior to all these. Several uterine applicators are wound with cotton and dipped in formalin, and then introduced into, or slightly beyond the external os at each treatment. Treatments are repeated once or twice weekly for three or four weeks before relief is expected. [12]Solatich used a solution yielding active chlorine and with 5-10 treatments. He reports many successes.

Actual Cautery is very popular in the treatment of cervical disease, and has been in use from time to time since first introduced by Bryne in 1882. Hunner used the Paquelin cautery for endocervicitis and reported his work in 1906. Dickinson began the use of the nasal cautery tip in office treatment of endocervicitis in 1911, and since then has reported good results. Microscopic study of tissues taken from different portions of the cervix indicate that the glands near the external os are commonly infected while those near the internal os may appear normal. Since 1921 [13] Davis and Crow have been using the electric cautery with very satisfactory results. A light weight cautery tip from ½ inch to ¾ inch in length is used with switch button in the handle. 317 patients have been treated in the office in this manner without anaesthesia or with nitrous oxide analgesia. The amount of cauterization varied with the individual case. In many cases it was necessary to cauterize only the gland near the external os and the eroded areas. The cauterization was done in lines through the glands leaving normal gland tissue to regenerate. In some cases two or three treatments were required to destroy the Nabothian cysts and infected glands. [13]Davis noticed that more satisfactory results were obtained in patients cauterized within eight weeks after delivery. Following cauterization there is a marked increase in the amount of discharge for the first two weeks, and the discharge persists often for 4-5 weeks. The first period is usually more profuse than normal. Sex trauma should be avoided for at least four weeks after cauterization. The vagina is douched two or three times weekly and the cauterized area painted with mercurochome 220 soluble, or tincture Benzoin Co. until healing is complete, although this not always necessary. The cervix also has to be kept clean and dilated during healing, or stenosis may follow, chiefly at the external os. In the Toronto General Hospital packing is placed in the canal at the time of cauterization and left for 24-36 hours. This

prevents stenosis in most cases. [14]Cashman recommends also the following method for its prevention. Four weeks after cauterization when the slough has disappeared and a clean granulating wound is formed, dressing forceps are passed into the cervical canal under aseptic conditions. This is repeated once weekly for four or five weeks until epithelialization of the canal is complete and thereafter there is no trouble. [15]Abrams simply used uterine dressing forceps heated to a cherry red, and inserted them into the previously cleansed cervix for two or three seconds. He found they would penetrate further on account of their finer points; and [14]Cashman proved that cautery destroys glands for some distance beyond the area of actual cauterization making possible complete cauterization. Severe haemorrhage following cautery is rarer than that following surgery, coning out or amputation of the cervix, and is controlled by packing the vagina. Cautery is contraindicated in cases of acute cervical infection, uncorrected retro-displacements, syphilis of the cervix, and at the time of an operation to shorten the utero-sacral ligaments. In case of failure of cautery [13]Davis and Crow do a Sturmdorf excision, or one of the other types of amputation of the cervix.

Radium is much used by [9]Curtis in the failure of cure of chronic leukorrhœa by formalin injection. He reports great success. Ninety patients in a series of 104 or 87 per cent., have been completely cured; seven have been improved and seven have remained unchanged, as the result of treatment by radium. His technique is as follows: Under gas and oxygen anaesthesia the cervix is thoroughly dilated and fifty milligrams of radium screened with one mm. of platinum and encased in a finger cot, are inserted into the cervix up to the level of the internal os. The radium is kept in position by a suture through the cervix at the level of the external os and through the outer end of the encasement of the radium. The radium is removed in fourteen to eighteen hours. He now occasionally uses fifty mgm. radium screened in half mm. gold foil, and leaves it only four to six hours. If treatment is not curative after the first application, a second may be given in 10-12 weeks, and even a third and fourth may have to be given at similar intervals, although one is usually sufficient to bring about a complete cure. The dangers in the use of radium are but few; there is a possibility of an artificial menopause and sterility following radium in about two per cent. of cases under the most careful technique. The risk is greater in the hands of others. The immediate result of radium treatment is increased discharge which persists for many weeks. This stage is followed by a stationary phase of one or two months Then, afterwards, there is usually gradual improvement, perhaps up to nine months or a year from the time of the first treatment. In the meantime the cervix should be dilated occasionally to prevent stenosis. The action of radium is to destroy the tissue in its immediate vicinity, and it results in healing by fibrosis and scar formation. [13]Davis and Crow state that radium cannot be limited to cervical glands, and that it is too expensive for the ordinary practitioner. If radium brings about a cure, these two factors are not as important as they might appear. [7]Reder agrees with [9]Curtis in the value of radium treatment, and says that it is only a question of whether a woman in the menstrual age will consent to the use of radium with the risk of sacrificing her menstrual function. [16]Watkins says curettage should not be recommended and advocates dilatation and the most careful use of radium. [12]Salatich agrees with results of radium, but states that its value is limited in cases with displacements.

Surgery in the form of amputations and excisions is still in vogue. The Sturmdorf coning operation removes a cone shaped core out of the cervix, beginning at the external os, and removing all endocervical glands. In cases unbenefited by this type of operation, a

complete amputation of the cervix is often done and gives good results. In cases of tears and fibrosis the cautery is deemed better than surgery.

Conclusions.

1. Leukorrhoea is a term applied to any discharge from the vagina, whether physiological or pathological, except discharges containing blood.

2. Leukorrhoea can be classified as (1) Physiological, (2) Pathological non-inflammatory, (3) Pathological inflammatory, according to the causative factors of each.

3. The most important foci of infection in the inflammatory type are to be found in Skene's ducts and in the uterine cervix. The chief cervical lesion consists in a hyperplasia of the infected cervical glands, endocervical granulations and strictures, and erosions of the cervix.

4. The organism responsible for the chronic leukorrhoea is streptococci in thirty per cent. of cases and gonococci in the remainder.

5. Treatment of leukorrhoea varies with the cause, and the treatment of the inflammatory type can be divided into acute and chronic. In the acute cases the treatment is that of acute gonorrhoea.

6. The chronic stage is less amenable to treatment than the acute stage. Chronic leukorrhoea of cervical origin is usually curable through dilation of the cervix and treatment with small doses of radium applied at infrequent intervals. The prognosis is less favorable in those cases with chronic cellulitis or uncorrected gross pelvic lesions.

7. Actual cautery promises to give good results in the treatment of chronic endocervicitis and cure of leukorrhoea, and is perhaps the most valuable.

8. Excision of a cone-shaped piece from external os extending well up to the internal os is successful in a large per cent. of cases.

9. Medical treatment, formalin, hygroscopic solutions and solutions yielding chlorine are useful.

10. The use of radium necessitates careful administration to avoid menopause and sterility in over two per cent. of cases.

11. Discharges arising from Skene's ducts are relieved by free incision and fulguration of the infected tracts.

12. Surgery should not be attempted until palliative means have failed.

13. Treatment should be attempted in all cases of pathological discharge from the vagina.

Bibliography.

1. Burns, J. W. L.: Practitioner, '24; 112, 53.

2. Crossen, H. S.: Text Book Gyn., '27; 1025, 1029.

3. Munro Kerr: Obst. and Gyn., '23; 282, 620.

4. Rubin, I. C.: Symptoms in Gyn., '25; 190.

5. Kelly, J.: Practitioner, '24; 112, 59.

6. Graves, W. P.: Gynaecology, '24.

7. Reder, Frances J.: Obst. and Gyn., '21; 1, 710.

8. Barton: Barton and Yates Sym. Diag., '27; 570.

9. Curtis, A. H.: J.A.M.A., June 19, '20; 74, 1706.

10. Black and Llewellyn: J.A.M.A., Dec., '17; 69, 2025.

11. Stewart, Doug,: Practitioner, '24; 112, 58.

12. Davis and Crow, C.H.: J.A.M.A., '26; 86, 1763.

13. Salatich, P. B.: J.A.M.A., '20; 74, 1710.

14. Cashman, B. Z.: J.A.M.A., '25; 85, 421.

15. Abrams, S. F.: J.A.M.A., '25; 85, 418.

16. Walkins, T. J.: J.A.M.A., '20; 74, 1711.

17. Sturmdorf Mathews Surg. Gyn. and Obst, '21.

Mikles, F. M.: Surg. Gyn. and Obst., July, '26.

Bourne, A. W.: Surg. Gyn. and Obst., Nov. '23; 37, 657.

Eden and Lockyer, '21.

Gask and Wilson: Surgery, '21.

Hydrophobia.

Report of a Fatal Case Following a Full Course of Pasteur's Treatment.

(Ray M. McKeown, M.A., 2T9.)

The interest in this case lies not necessarily in the rarity of the disease, but rather in its demonstration of the questionable prognosis for an individual bitten by a "mad dog" about the face, even though Pasteur's preventive inoculation is carefully carried out.

The patient, a white farmer boy aged seventeen years, was admitted to the James Whitcomb Riley Hospital for Sick Children in Indianapolis on July 10, 1927, with the complaint of extreme nervousness, continuous vomiting, severe headache, and great difficulty in swallowing fluids.

The boy had been bitten in the right upper lip by a dog—seemingly normal—on June 19th. The family worried a great deal about the bite, and on June 23rd the family doctor began a course of fourteen Pasteur treatments. These were completed on July 6th. While taking this course the lad had been in swimming daily in a creek near home. He had felt sore in his abdomen "from the medicine," but was apparently otherwise all right. The day following the completion of the course, on July 7th, headache was complained of, and suddenly projectile vomiting began—first of food, then of mucous and phlegm. It was then noticed that "light hurt his eyes," and that "his throat troubled him so that he could not seem to swallow a thing." On this day he went to bed but obtained no relief so "got up again." He has had almost constant "pain about his face" since July 7th, and has eaten only a little ice-cream and one glass of milk which was vomited almost immediately afterwards. A "physic" was given which was retained and gave good results. He has "gasped for air" for the last twenty-four hours.

The past and family histories were of no bearing in the case.

The physical examination revealed a well-developed white boy, age seventeen years, and weighing 128 pounds. He was extremely irritable, nervous, and unco-operative. The eyes were bulging—first staring, and then rolling about. The pupils were nearly equally dilated, and very sluggish to light. The lips were dry and cracked. The mouth and tongue were in constant tremor. The tongue was "furred." The tonsils were large and markedly inflamed. A blue scar was noted on the right upper lip, circular in shape, and about the size of a pencil end. Pain was constantly complained of over the entire face, but particularly over the right maxillary antrum, right frontal sinus, and right temporal region. The carotids of the neck showed a very forceful heart impulse. Chest showed equal lung excursions. Heart normal but fast in rate. Abdominal skin reflex accentuated. Both knee reflexes considerably increased. No Babinski present, but a slight Kernig was noted. All other examinations were normal or negative.

The general impression was rabies of twenty-one days' incubation.

The patient was immediately sent to the Isolation Ward. The laboratory work done at once disclosed:

1. W. B. C. 14,750.
2. Differential—
   (a) Lymphocytes 17 per cent.
   (b) Large Mono's 4.5 per cent.
   (c) P. M. N.'s 78.5 per cent.
3. Spinal Fluid
   (a) Character—Clear.
   (b) Globulin—Slight Pandy.

(c) Glucose—Negative.
(d) Cells—36.
(e) Pressure—193 millimeters.

The progress recorded indicates the eventual development and result of the case:

July 10th, 6.50 p.m.—Patient admitted to Isolation Ward. Spinal puncture made. Face very flushed. Craves water, but can't swallow it. Shivers constantly. Spits up a frothy, ropy saliva. Severe headache. Moans, cries out. The T. P. R. was 103.2°—86—20.

8.30 p.m.—Beginning of marked mental symptoms. Delusions, cries out in fear. Claims nurse is "hammering his head." Swears. Tears at anything he can get his hands on. Vomiting and spitting continual. T. P. R. 105.6°—96—22.

9.00 p.m.—Morphine gr. ¼ given hypodermically. Constant clonic spasms. Opisthotonos. Gasping for breath. Hypodermic seemingly without effect at end of twenty minutes. T. P. R. 106°—94—22.

9.35 p.m.—All mental symptoms rapidly becoming extremely severe. Vomitus now a brown, foul, fecal fluid. Morphine gr. ¼ again given.

10.00 p.m.—Morphine without effect. Definitely maniacal. Tears gauze restraining bandages loose as though they were twine. Restraining jacket applied.

11.00 p.m.—Morphine gr. ¼ hypodermic again given. Condition now terrible.

July 11th, 12.30 a.m.—Patient quieted with chloroform by inhalation. Chloral hydrate gr. 40 then given by rectal solution. Recovered well from chloroform and quickly quieted by chloral hydrate.

4.30 a.m.—Respiration and circulation ceased.

At autopsy the following was the

Anatomical Diagnosis.

1. Congestion of meningeal vessels, moderate, very probably rabies, in light of clinical features and pathological findings.
2. Broncho-pneumonia, early, right lobe.
3. Moderate parenchymatous degeneration of liver.
4. Persistent thymus.

Negri bodies demonstrated in smears from brain.

This case may well be said to have produced a typical textbook picture of "furious rabies." The only saving feature in rabies is the slow rate of travel of the virus along the course of nerves adjacent to the bite to the brain. However, as can readily be seen, bites about the face and head are in close proximity to the brain, and we hence would expect a greater mortality than that produced from bites elsewhere. Such is the case, for, from Babes percentage table mortality, we find that bites about the face have a mortality percentage between fifty and sixty per cent.—much greater than those cases bitten elsewhere. In the failure of Pasteur's treatment we are lead to consider three particular causes for such failure:

1. That the individual had been infected too severely.
2. That the individual was too susceptible.
3. That the individual had been infected with too virulent a virus.

The first reason seems indicated as the cause for failure here since it was at least four days after the bite before Pasteur's specific vaccine was begun, and, with the close proximity of the bite to the brain, one is inclined to believe that the virus had too great a start on the antirabic vaccine. However, this point is debatable. It is possible that immediate cauterization of the wound and antirabic treatments begun at once would have led to a favorable prognosis.

References.

1. Babes, Victor: "Troite de la Rage," Paris, J. B. Balliere, 1912.
2. Nelson's Loose Leaf Medicine, Vol. II., pages 142-146.

FACULTY NOTES.

At Home.

The Medical Society announces the appointment of the following committee: Chairman, G. C. Large; Secretary-Treasurer, H. R. Ziegler; Councillors, W. S. Kergin, K. D. McEachern, J. C. Scott and J. G. McInnes. The committee is already active, having held a successful dollar dance at U. T. S. on November 12th. Mr. Large announces that there will be more of these dances, the profits of which will go towards the expenses of the At-Home which is to be held at the King Edward Hotel on January 31st, 1928.

Daffydil.

Mr. D. M. Campbell is the newly appointed chairman of Daffydil Committee, L. H. Lewis, B.A., secretary; J. Shier, B.A., treasurer; A. W. Walker, editor of "Epistaxis" The annual frolic will be staged in the second week of February.

A. O. A.

The annual banquet of the Toronto Chapter of Alpha Omega Alpha was held in the King Edward Hotel on November 25th, President K. G. Gray acting as toastmaster. The following were admitted to membership: T. H. Belt, L. R. Angus, B.A., T. D. Kendrick, B.A., S. Narofsky, H. R. Ziegler, C. L. Duff, L. J. Harris, A. Appel, and Miss C. Cohen, M.A.

Mr. J. R. Robertson, president of the graduating class, represented the Medical Society at Queens' Aesculapian Society's At-Home and Banquet, November 18th and 19th. He reported very excellent entertainment and hospitality.

Hon. Treasurer.

Professor Duncan Graham has graciously consented to act as Honorary Treasurer of the Medical Society for the year 1927-28.

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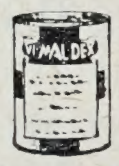

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Larger portraits for framing may be had from the same negative.

This offer is for ten days only. Naturally we cannot take all the sittings during that time, but you can call and make an appointment and reservation will be made for you.

MILNE STUDIOS, Limited

106 YONGE STREET ELGIN 6713

To render a more convenient service the Studio will be open from 6 to 9 p.m. as well as from 9 a.m. to 5 p.m.

When you give a portrait by MILNE, you are giving yourself at your best.